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ORIGINAL ARTICLE

PERCEPTION OF THE MIDLINE DEVIATIONS IN SMILE ESTHETICS BY LAYPERSON

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ABSTRACT

Objective: *This study aimed to assess laypersons' perception of upper dental midline deviations and explore how viewing adjacent facial structures, including lips, chin, and nose, influences the diagnosis of such deviations.*

Materials and Methods: *A comparative cross-sectional study involving 100 patients was conducted using a non-probability consecutive sampling technique. Participants meeting inclusion criteria (age 18 years or older, no prior orthodontic treatment, normal or corrected-to-normal vision) provided written informed consent. Patients with craniofacial anomalies, severe dental malocclusions, ongoing orthodontic treatment, psychological disorders affecting self-perception, and personals having professional training in dentistry were excluded from the study. Photographs of a female subject with digitally manipulated upper dental midline deviations (0mm to 5mm) were categorized into two groups. one with adjacent facial structures (LCN) and one with lips only (L). Layperson evaluators assessed aesthetic appeal using a Visual Analog Scale (VAS).*

Results: *Among 100 participants (mean age 31.41 ± 8.01 years; 40% female), perception scores decreased significantly with increasing midline deviation ($p < 0.001$). One-way ANOVA revealed a significant association between midline deviation and perception scores ($p < 0.001$). Perception scores were lower in the LCN group compared to the L group.*

Conclusion: *Laypersons were able to detect upper dental midline deviations of 1mm or more when viewing adjacent facial structures. However, they required deviations of 2mm or more when focusing solely on lips. Viewing adjacent structures influences laypersons' perception of midline deviations.*

Keywords: *Esthetics, Layperson, Malocclusion, Midline, Patient Preference, Perception, Personal Satisfaction, Smile, Soft tissue.*

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INTRODUCTION

The attractiveness of a smiling face is often heavily associated with the smile itself, with research suggesting that it plays a significant role in social interactions and perceptions.[1] A smile is not only a facial expression but also a reflection of various tissues working together harmoniously.[2] When we see an attractive face adorned with a beautiful smile, it tends to enhance social communications, making interactions more pleasant and engaging.[3] This effect can be attributed to the psychological impact of a smile, which is often seen as inviting, friendly, and approachable. Several tissue types contribute to the formation of a smile, including the teeth, lips, gingiva (gums), and skin. Each plays a crucial role in shaping the overall appearance and attractiveness of the smile. For instance, the condition of the teeth, the shape of the lips, the health of the gums, and the texture of the skin all contribute to how a smile is perceived.[4]

In dental aesthetics, aligning the maxillary dental midline with the face's center is crucial. This principle, known as smile design, creates balance and harmony, enhancing the smile's attractiveness by ensuring it complements facial features naturally, avoiding misalignment or asymmetry.[5]

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With smile, aesthetics playing a pivotal role in patients' decisions to undergo orthodontic treatment, it has garnered considerable attention from both patients and orthodontists alike. Orthodontists are increasingly incorporating smile aesthetics into their treatment planning process.[6] Aligning dental midlines are deemed crucial for achieving functional occlusion. While the consensus acknowledges the importance of aligning the maxillary dental midline with the facial midline, a symmetrical dental arrangement is often associated with an attractive smile, whereas asymmetry may detract from dental aesthetics.[7] Among various dental and occlusal irregularities, patients are most likely to notice midline discrepancies. This study seeks to evaluate how laypersons perceive upper dental midline deviation aesthetically.[8]

The perception of midline deviations in smile esthetics by laypersons is a complex interplay of visual, psychological, cultural, and societal factors. Recognizing the significance of midline alignment and its impact on overall smile aesthetics is paramount for dental professionals striving to deliver patient-centered care. By understanding and addressing patient preferences and societal norms, dental practitioners can optimize treatment outcomes and contribute to their patients' overall well-being and satisfaction.

The objective of this study was to assess how laypersons perceive upper dental midline deviations and to examine how viewing adjacent facial structures, such as lips, chin, and nose, affects the diagnosis of midline deviations.

METHODOLOGY

This comparative cross-sectional study was conducted at the Department of Orthodontics from December 1, 2023, to March 10, 2024; involving 100 patients selected using a non-probability consecutive sampling technique. Ethical approval was obtained before the inception of this investigation. Written informed consent was obtained from all participants eligible according to the inclusion criteria.

Inclusion criteria comprised individuals/participants aged 18 years or older, with no prior orthodontic treatment, and possessing normal or corrected-to-normal vision. Participants were required to volunteer for the study. Exclusion criteria encompassed individuals with a history of craniofacial anomalies or syndromes impacting facial aesthetics, severe dental malocclusions or missing teeth, and ongoing orthodontic treatment. Additionally, those with psychological disorders affecting self-perception or self-esteem were excluded. Lastly, participants with professional training or experience in dentistry or related fields were not considered eligible.

A sample size calculation, following Pandis' formula[9], aimed for a statistical power of 90% and a confidence interval of 95% ($\alpha = 0.05$). Utilizing Motta's standard deviation of 20.88 mm to detect a mean difference of 10 in VAS scores[10], 92 evaluators were determined as sufficient. We have taken 100 participants in our study.

A female individual accompanying a patient with normal occlusion was selected from the orthodontic department to serve as the subject for this study. Frontal photographs were captured while she smiled, and subsequently digitally manipulated using Adobe Photoshop CS6 to introduce progressive deviations in the upper dental midline, ranging from 0mm to 5mm. These altered images were then categorized into two groups: one encompassing the lips, chin, and part of the nose (LCN), while the other solely included the lips (L). Layperson evaluators were tasked with rating the aesthetic appeal of these photographs using a Visual Analog Scale (VAS) graded on a 100-point scale, where 100 represented the highest level of acceptability and zero indicated the least acceptable appearance.

Statistical analysis was conducted using R software version 4.1.2. Means and standard deviations (SD) were calculated for numerical data such as age and perception scores. Categorical data, such as gender, were presented as frequencies and percentages. Independent t-tests were performed to compare the perception scores between the two groups (LCN and L) for each level of midline deviation. A significance level of $p < 0.05$ was considered statistically significant.

RESULTS

The average age was 31.41±8.01 years. Females were 40(40%). (Table 1)

Table 2 & Fig 1 illustrates the perception scores corresponding to varying degrees of midline deviation with surrounding structures among a sample of 100 individuals. As the midline deviation increases from 0mm to 5mm, there is a significant decrease in perception scores ($p < 0.001$), suggesting a correlation between increasing midline deviation and diminished perception scores.

Among the different levels of midline deviation, the highest mean perception score was observed at 2mm (88.06 ± 6.03), while the lowest mean perception score was recorded at 5mm (43.68 ± 6.11). Statistical analysis using one-way ANOVA revealed a significant association between midline deviation and perception scores ($p < 0.001$). As the midline deviation increases from 0mm to 5mm, there is a notable fluctuation in perception scores, with deviations tending towards lower scores, indicating a potential impact of midline deviation on perceptions related to lips (Table 2 & Fig 1).

The line graph shows that overall; the perception score

of midlines with various amounts of deviation is lower in the group featuring teeth with lip, chin, and nose compared to the group with teeth and lips only (Fig. 3).

DISCUSSION

The primary aim of this study was to investigate how laypersons perceive upper dental midline deviations and to explore how the inclusion of adjacent facial structures, such as lips, chin, and nose, influences the assessment of midline deviations.

Notably, our analysis revealed a significant decrease in perception scores ($p < 0.001$) as midline deviation increased from 0mm to 5mm. This suggests a clear correlation between increasing midline deviation and diminished perceptions of facial aesthetics among laypersons. Additionally, we observed that perception scores fluctuated notably across different levels of midline deviation, with the highest mean perception score recorded at 2mm and the lowest at 5mm. These findings underscore the importance of precise assessment and

TABLE 1: DISTRIBUTION OF AGE AND GENDER

Characteristic	N = 100
Age(years)	31.41 ± 8.01
Gender	
Female	40 (40.00)
Male	60 (60.00)

TABLE 2: COMPARISON OF PERCEPTION SCORE AMONG INCREMENTAL INCREASE IN MIDLINE DEVIATION WITH SURROUNDING STRUCTURES (N=100)

Characteristic	Midline deviation*						p-value**
	0mm	1mm	2 mm	3 mm	4 mm	5 mm	
Perception Score	81.98 ± 5.62	82.37 ± 5.70	72.51 ± 5.31	69.35 ± 6.07	51.64 ± 5.29	28.86 ± 5.43	<0.001

*Mean ± SD, ** One-way ANOVA

TABLE 3: COMPARISON OF PERCEPTION SCORE AMONG INCREMENTAL INCREASE IN MIDLINE DEVIATION WITH LIPS ONLY (N=100)

Characteristic	Midline deviation*						p-value**
	0mm	1mm	2 mm	3 mm	4 mm	5 mm	
Perception Score	83.26 ± 5.15	84.54 ± 5.93	88.06 ± 6.03	71.47 ± 5.73	67.37 ± 6.05	43.68 ± 6.11	<0.001

*Mean ± SD, ** One-way ANOVA

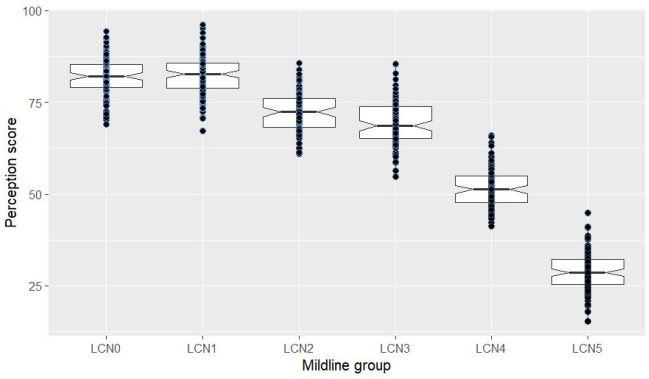

Fig 1: Perception score among incremental increase in midline deviation with surrounding structures

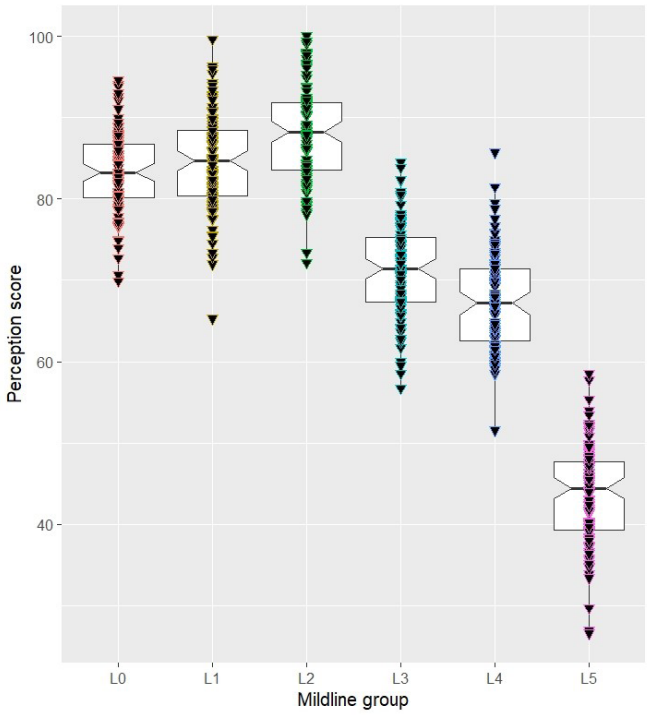

Fig 2: perception score among incremental increase in midline deviation with lips only

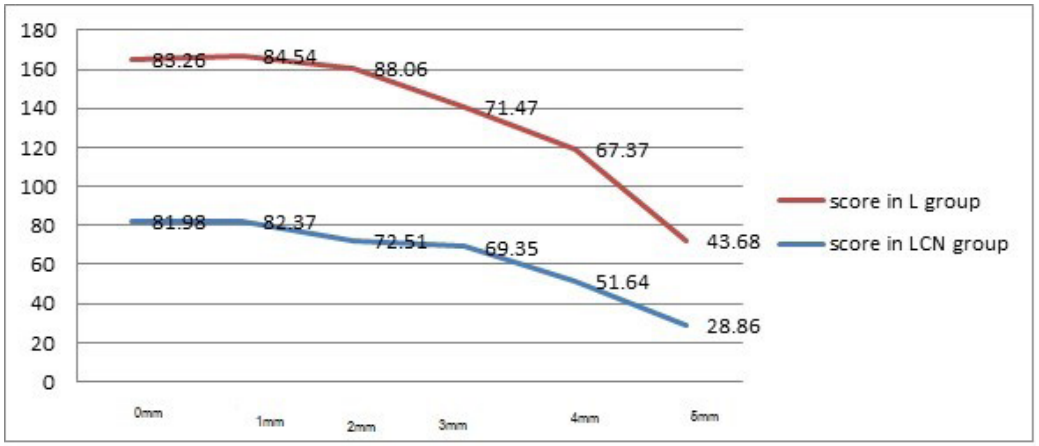

Fig 3: Line graph of perception score for various midline deviation for with surrounding structures (LCN) and with lips only (L)

management of midline deviations to optimize facial aesthetics outcomes. Similar findings were reported by others.[7]

Facial features such as hair color, facial pattern, skin tone, and gender play significant roles in influencing how individuals perceive the aesthetics of a smile. For instance, certain hair colors or facial patterns may draw more attention and affect the overall impression of a smile. Additionally, factors like skin tone and gender can contribute to varying aesthetic preferences and perceptions.[11,12] To investigate the impact of these facial features on the evaluation of facial midline structures, our study utilized two different settings for the photographs. These settings were categorized into two groups: LCN (featuring lips, chin, and nose) and L (featuring only lips). By employing these settings, we aimed to assess how the inclusion or exclusion of surrounding facial structures affects the perception and evaluation of the facial midline.

Furthermore, our statistical analysis using one-way ANOVA confirmed a significant association between midline deviation and perception scores ($p < 0.001$), reinforcing the impact of midline deviation on facial aesthetics. As midline deviation increased, perception scores tended towards lower values, indicating a potential influence of midline deviation on perceptions related to adjacent facial structures, particularly the lips. Previous studies also reported that incremental increased in midline deviation there is decrease in perception of layperson.[7,13]

The overall perception scores of midlines with various deviations were lower in the group featuring teeth with lip, chin, and nose compared to the group with teeth and lips only. This suggests that the presence of additional facial structures may amplify the impact of midline deviation on perceived aesthetics. Possible reasons for this discrepancy could include increased complexity and interactions among facial features in the former group, leading to heightened sensitivity to asymmetry or deviations.

A previous study revealed that laypersons exhibited greater sensitivity in detecting alterations in the upper dental midline when viewing photographs from a specific group (LCN group). Notably, statistically significant variances were identified in all comparisons of midline shifts within the LCN group's images, underscoring laypersons' capacity to detect even minor deviations. Conversely, in photographs from another group (L group), significant variances were only evident for midline shifts of 2mm or larger.[7] This implies that laypersons may encounter difficulty in identifying smaller deviations when detailed anatomical information is absent.

Other studies conducted international and in Pakistan also reported that midlines deviation more than 1.5mm is significant concerns among laypersons.[14-18]

CONCLUSION

Based on our finding it can be concluded that observing adjacent structures of smiles, laypersons could discern deviations as small as 1mm or more in the upper dental midline. However, when their focus was solely on the lips, they were able to detect deviations of 2mm or more.

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1. Imtisal Asim	Design of the work , Acquisition and analysis of data, Wrote original draft.
2 Shahab Adil	Supervision, Reviewing and Final approval of the version to be published.
3 Zafar Ul Islam	Interpretation of data, Data analysis and Reviewing it critically.
4 Hasan Ali Raza	Review in the draft critically for important intellectual concept.
5 Ghazala	Data analysis.
6 Sana Naz	Literature search, Data collection and Analysis.